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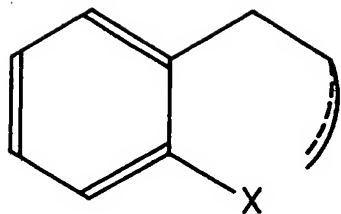
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(56) Documents cited
GB 1507469 US 4444938
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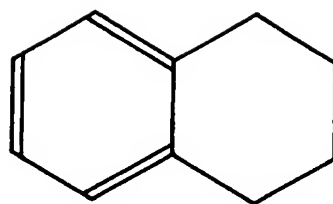
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C3K
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C3V

(54) White vinyl chloride polymer compositions

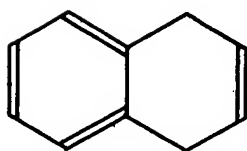
(57) White compositions based on a polymer derived from vinyl chloride and including a crosslink promotor to make them radiation crosslinkable are distinguished by the use as a discolouration inhibitor of an aromatic compound including the structure shown in Formula I. In the Formula, X represents a non-functional radical or an atom having (in either case) a valancy of 2 or 3 and completing a ring of not less than 5 nor more than 7 members. The preferred discolouration inhibitor is tetralin. The compositions may also include plasticisers, fillers, stabilisers and other conventional ingredients provided they are white or substantially colourless.



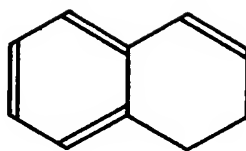
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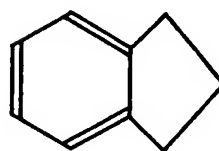
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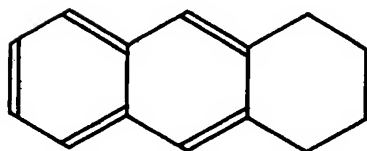
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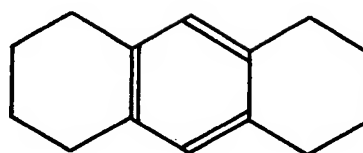
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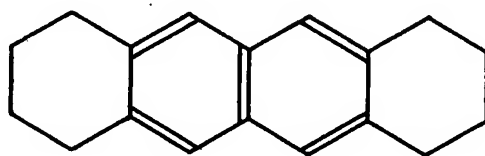
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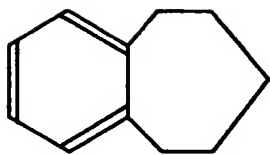


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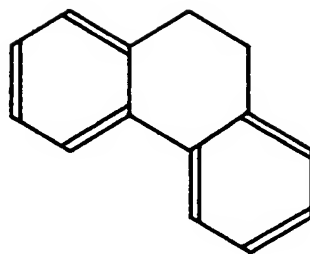


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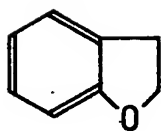
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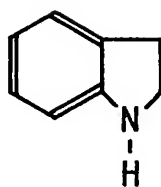
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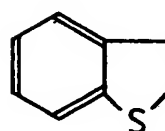
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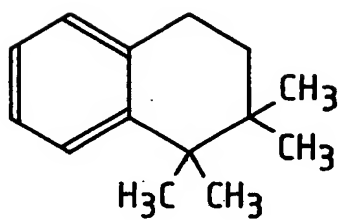
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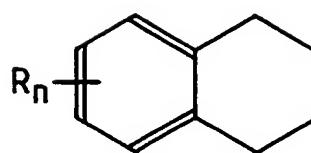
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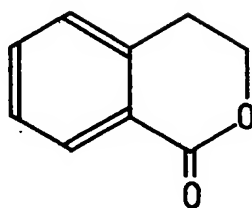
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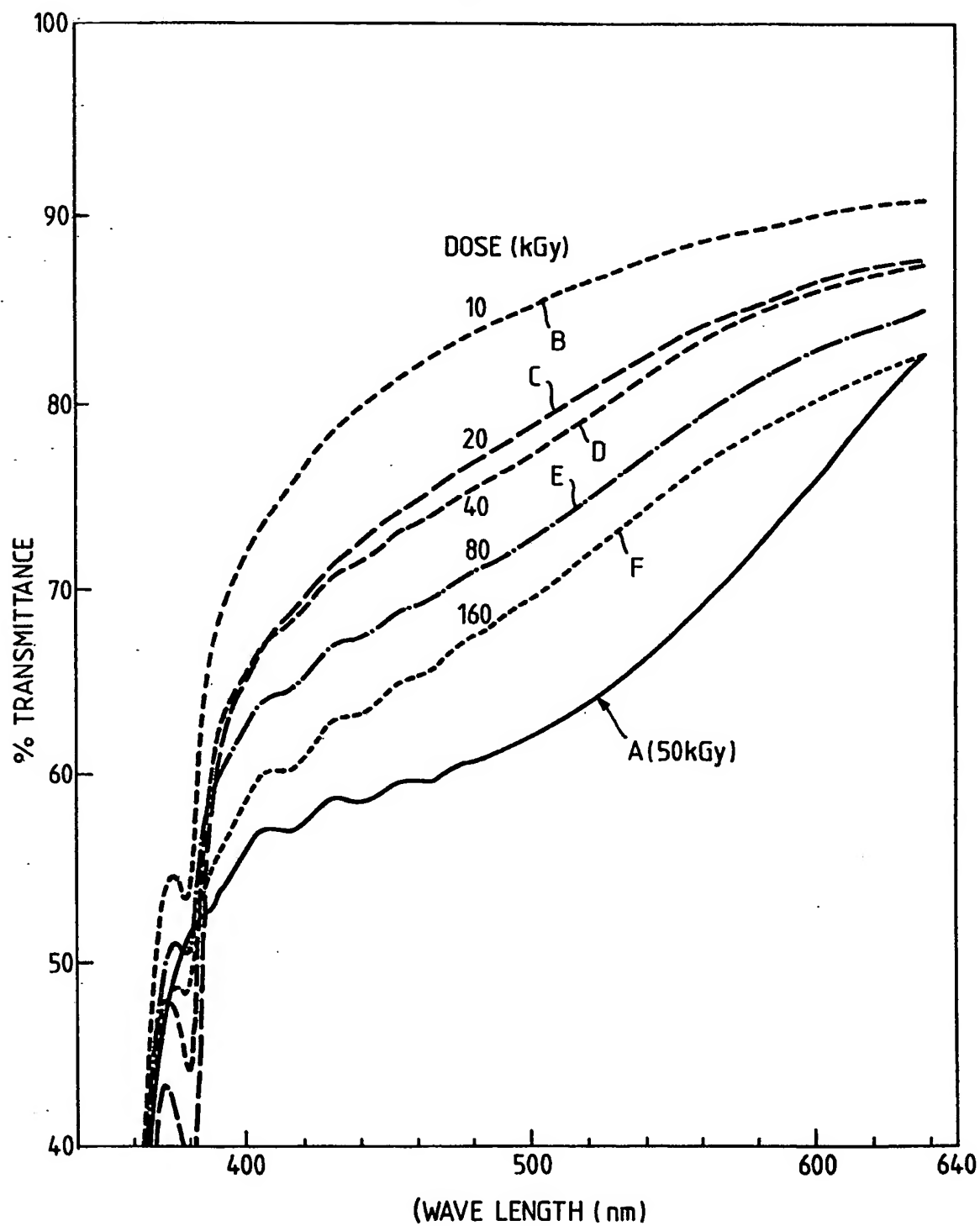


XV



XVI

Fig. 1.



UV/VIS SCATTERED TRANSMISSION SPECTRA OF PM212 COMPOUND
CONTAINING 2 phr TETRALIN AT VARIOUS DOSES

SPECIFICATION

White polymer compositions

5 This invention relates to white polymer compositions and more specifically to compositions based on polymers derived from vinyl chloride, more especially vinyl chloride homopolymer (PVC) whether plasticised or rigid.

10 It is known that, in the presence of suitable promoters, such polymers can be crosslinked by irradiation (for example with gamma rays or high-energy electrons) to achieve useful modifications to certain mechanical and other properties, particularly at elevated temperatures.

When the composition is white, however, discolouration is observed as a side-effect of irradiation; for example typical white plasticised PVC wire-coating compositions may develop a pink colouration strong enough to risk confusion with similar compositions intentionally coloured pink with pigments.

Aromatic compounds are generally considered to have a 'protective' effect and to reduce the extent of discolouration, but we have found that discolouration can be a problem even in compositions containing nearly 30% by weight of a phthalate ester plasticiser.

The invention is based on the discovery of a group of compounds that inhibit discolouration to a much greater extent than the general run of aromatic compounds without having serious deleterious effects.

The essential ingredients of the white compositions in accordance with the invention are

- (i) a polymer derived from vinyl chloride;
- (ii) a crosslink promoter; and
- (iii) as a discolouration inhibitor an aromatic compound including the structure shown in formula I (see the accompanying drawing) wherein X represents a non-functional radical or an atom having (in either case) a valency of two or three and completing a ring of not less than five nor more than seven members.

The compositions may also include plasticisers, filler, stabilisers and other conventional ingredients provided they are white or substantially colourless.

The simplest and preferred substance for the structure defined is tetralin (also called tetrahydronaphthalene) in which X is a dimethylene radical. The formula of tetralin is shown as formula II. Formulae III to XVI show other suitable compounds or sub-groups thereof. In formula XV, R represents an alkyl group of up to six carbon atoms and n an integer from 1 to 4.

The discolouration inhibitors described (like known alternatives) inhibit cross-linking to some extent, and it is therefore necessary to make small upward adjustments in promoter content and/or irradiation dose if substantially the same mechanical properties are to be obtained as for (coloured) compositions without them.

Example

A conventional irradiation-curable PVC wire coat-

ing formulation with conventional lead-based stabiliser system and di-2-ethylhexyl phthalate plasticiser includes 15 phr of trimethylolpropane trimethacrylate (sold under the trademark Sartomer 350) as promoter. The promoter is believed to be stabilised with quinol to inhibit self-polymerisation.

The conventional compound is ordinarily irradiated (by gamma or electron-beam) to a dose of 50 kGy, and this produces severe pink discolouration in white formulations, as indicated by curve A in Figure 1, which is a scattered-transmission spectrum extending over the ultraviolet and visible regions. All spectra were measured after annealing at 85°C for 15 minutes and standing for at least a week.

Addition for 2 phr of tetralin gave compounds with a considerably reduced tendency to discolour, as indicated by curves B-F in Figure 1 for various radiation doses. Significant reduction in high-temperature tensile properties accompanied this change, but could be restored to nearly the original value by increasing the content of trimethylolpropane trimethacrylate from 15 to 20 phr and reducing the radiation dose to 40 kGy, with only a small increase in discolouration.

Irradiation in the example was by electron-beam radiation in air; discolouration of surfaces irradiated in nitrogen or otherwise protected from oxidation is more severe, but results are qualitatively similar.

For comparison, similar compositions were made using anthracene and decalin (decahydronaphthalene) in place of tetralin. Anthracene produced comparable but smaller increases in transmittance above about 440nm, except for very high radiation doses but introduced very strong absorption at about 400nm and below, corresponding to a strong yellowish discolouration. It also formed an undesirable bloom in the surface of the material. The effect of decalin was negligible.

CLAIMS

1. A white polymer composition comprising
 - (i) a polymer derived from vinyl chloride.
 - (ii) a cross-link promoter and
 - (iii) as a discolouration inhibitor an aromatic compound including the structure shown in formula I wherein X represents a non-functional radical or atom having (in either case) a valency of 2 or 3 and completing a ring of not less than 5 nor more than 7 members.
2. A composition as claimed in Claim 1 in which the discolouration inhibitor is tetralin.
3. A composition as claimed in Claim 1 in which the discolouration inhibitor is selected from the substances of formulae III-XVI.
4. A white PVC composition substantially as described with reference to the example.
5. A wire coated with the composition claimed in any one of the preceding claims.